


“I hereby declared that I have read through this report and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Control, Instrumentation and Automation)”

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Date : **7 May 2007**

AUTOMATIC BLOCKING ROBOT


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**This Report Is Submitted In Partial Fulfillment of Requirements For The Degree
of Bachelor In Electrical Engineering (Control, Instrumentation and
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May 2007

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For my beloved family

Abstract

Automated Blocking Robot project is a project that have a mechanism to perform blocking sequence automatically. The application of this robot is for the ROBOCON 2006 contest. The purpose of ROBOCON contest is to encourage development of artificial intelligent, mechatronic and robotic technology as an engineering discipline. It also aims to cultivate innovation and creativity of young engineer. The main thing is this automatic machine must accomplished certain task in one of the event present in ROBOCON contest. In controlling the robot it require a PIC16F877 microcontroller which will be programming using mikroC, PROTEUS for circuit designing and IC Prog for burner or load the programming into the microcontroller. The tracking line concept will be use to make sure robot will move base on the line at the contest field. Two emitter infra red (IF) sensors will be use in this project. The IF sensor will be positioned at the strategic position so that the sensor can work effectively to detect line. The signal from the sensor will be an input to the PIC first before it will be process. Signal that come from PIC will control the wheel spin with the help of circuit and motor.

Abstrak

Automatic Blocking Robot merupakan satu projek yang mengaplikasikan penggunaan robot dalam pertandingan. Projek ini ialah projek yang melibatkan robot yang boleh melakukan aturcara menghalang secara automatik. Aplikasi robot ini ialah untuk pertandingan ROBOCON 2006. Tujuan pertandingan ini ialah untuk menggalakkan pembangunan sistem pintar, mekatronik dan teknologi robotik sebagai disiplin kejuruteraan. Pertandingan itu juga bertujuan membudayakan inovasi dan kreativiti jurutera muda. Perkara utama project ini ialah mesin automatik akan menyelesaikan tugas tertentu di dalam pertandingan ROBOCON. Robot ini akan dikawal menggunakan mikrocontroller PIC16F876A di mana akan diprogram menggunakan mikroC, Proteus untuk merekabentuk litar dan ICProg untuk muat turun program ke dalam mikrocontroller. Konsep mengikut garisan akan digunakan untuk memastikan robot akan bergerak berdasarkan garisan pada padang pertandingan. 3 unit sensor emitter infra red akan digunakan dalam projek ini. Sensor ini akan diletakkan di tempat yang strategik supaya dapat berfungsi dengan efektif untuk mengesan garisan. Signal daripada infra red akan menjadi input kepada PIC sebelum diproses. Signal yang datang daripada PIC pula akan mengawal pusingan roda dengan bantuan litar dan motor.

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LIST OF ABBREVIATION

DC	Direct Current
PSM	Projek Sarjana Muda
IR	Infra red
LED	Light Emitter Diode
PIC	Personal Interactive Communicator
ROM	Read only Memory
RAM	Random access Memory
MMU	Multimedia University
UM	University Malaya
UTM	University Teknologi Malaysia

LIST OF APPENDIX

APPENDIX	TITLE
A	Datasheet of PIC16F876A
B	Datasheet of L293D
C	List of programming in mikroC
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CHAPTER ONE

INTRODUCTION

1.1 Introduction

ROBOCON is an annual robot contest starting from 2002, just for university, college and polytechnic students in the Asia-Pacific region. Under a common set of rules, participants will compete with their peers in other countries to create a robot using their creative and technological abilities in an open competition. This contest aims to create friendship among young people with similar interests who will lead their countries in the 21st Century, as well as help advance engineering and broadcasting technologies in the region. This event will be broadcast in a country through an ABU member broadcaster. Before entering the ROBOCON as an international event, there will be a preliminary contest among a team in their own country. In Malaysia usually the team from all local university such as Universiti Teknologi Malaysia (UTM), Multimedia University(MMU) and Universiti Kebangsaan Malaysia(UKM) will compete to represent the Malaysia at the international stage. Every year, the theme of the game is different. In ROBOCON 2006, the theme is to build the tallest twin tower. This project will base on the ROBOCON 2006 rules and description of the automatic robot.

1.2 Project Objective

The main objective of this project is to construct the automatic robot that can perform the blocking sequence based on the ROBOCON 2006. The robot must be build specifically using the microcontroller PIC16F876A. The other objective is that the robot can move based on the line tracking concept. Another objective is the robot can move to the specific area that suitable to able to throw the blocker with their own technique.

1.3 Problem statement

In the ROBOCON 2006, the task is to build the tallest twin tower. So there will be robot that automatically move and build the tower. That robot is given the order to bring a spawn block and put it to the tower provided at the middle of the contest field. In this project, automatic robot will be build to block opponent robot

1.4 Project scope

Project scope is the limitation element of the project that will be specified. For example in this project it will be specify to 2 groups which is software and hardware. Then it will be combined to become a robot. Other scope is the robot description. The robot description for the project is first about the method of control. The method of control for this project is fully autonomous. Second is about the size. The maximum envelope size of automatic machines at the start zone is 1000mm(L) x 1000mm(W) x 2000mm(H). Next description is that the supply power of machine is not exceed 24volts VDC. The grid line at the contest field is approximately 250mm. Other scope is based on the size of the field and the rules and regulation of the tournament.

This project must use microcontroller in the robot building. And it is specify that the PICF876A are used in this project. The software of the project is mikroC. The sensor that will be use is infra red sensor. The motor that are being used is the DC motor.

Just as mention before that the other scope is based on the size of the tournament. It 's mean that in this project the specify path of the robot will be set. And the setting is based on the field size. The programming in the PIC16F876A specifies the path that will be reached. When reach the specific point that the programmer set, then it will stop and throw the blocker. The overall size of the field is 13000mm (L) x 13000mm (W). At the end of the path shows, the robot will stop and throw the blocker. The layout in the figure 1.1 shows the path of the blocker robot.

1.5 Project scheduling

Project scheduling is planning of the development of the project. It will start with research of the project and ending with PSM2 presentation. The Table 1.1 shows the planning development process of the project. It is represented as the Gantt chart:

Table 1.1: Gantt Chart of the project schedule

PERANCANGAN PROJEK PROJECT PLANNING													
Senaraikan aktiviti-aktiviti utama bagi projek yang dicadangkan. Nyatakan jangka masa yang diperlukan bagi setiap aktiviti. <i>List major activities involved in the proposed project. Indicate duration of each activity to the related month(s).</i>													
	2005							2006					
Aktiviti Projek Project's Activities	J	J	A	S	O	N	D	J	F	M	A	M	J
Research about the ROBOCON from video and internet, research about the mechanism to use and some material and sensor.	x	x	x	x	x	x	x	x	x	x			
Find software to design programming for PIC microcontroller, Study PIC microcontroller, Study Proteus 6 to design circuit for simulation.		x											
Designing and programming PIC microcontroller, Simulation for circuit PIC microcontroller, search and build programmer circuit for PIC microcontroller 16F877			x	x	x								
Start doing slide presentation for PSM1			x										
Presentation for PSM1				x									
Doing final report and slide presentation for PSM2						x	x	x	x	x	x		
Survey of material for robot building, budgeting the material price, study the mechanism of robot			x	x	x	x	x	x	x	x			
Construct the whole robot					x	x	x	x	x	x			
PSM2 presentation and hand over PSM final report										x	x	x	

CHAPTER TWO

LITERATURE REVIEW

2.1 Review type of the Blocking Robot

Based on the literature review of the tournament, it can be conclude that there is a many type of blocking method that has been use by the local team. This is an example that has been observed from the ROBOCON preliminary video file:

2.1.1 Example 1- Team ROBOCON UTM A

First let see the UTM A team. This team is using a unique and effective way to blocking their opponent. The method is using the long aluminum ladder blocking method. The purpose of this team blocking is to unable the opponent robot to reach the tower at all. But this method need the very fast motor and a light weight of the robot body so that the blocker robot can reach the tower first, then throw the blocker before the builder tower robot can reach the tower. The method is shown in the figure 2.1:

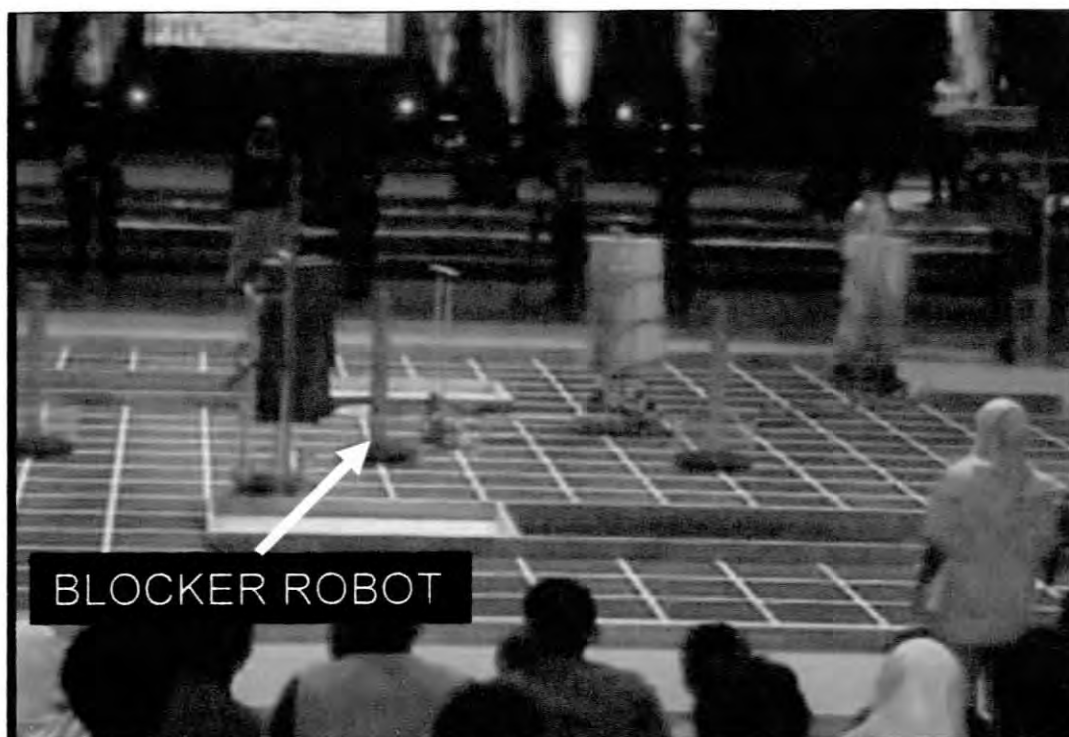


Figure2.1: This figure shows that the blocker robot is using the aluminum ladder method.

2.1.2 Example 2 –Team ROBOCON UTM C

Secondly, let see the team ROBOCON UTM C. This team using the most incredible method. The robot contain the builder and blocker at the same time. When the game started, the robot will move to the center tower as fast as it can and then after putting the polystyrene at the tower, the robot will siege the tower. It siege the tower using it's own aluminum body. This method is call siege blocking method. The opponent cannot enter the tower to put their polystyrene because the robot has siege the tower. Figure2.2 shows the siege method perform by the team UTM C.

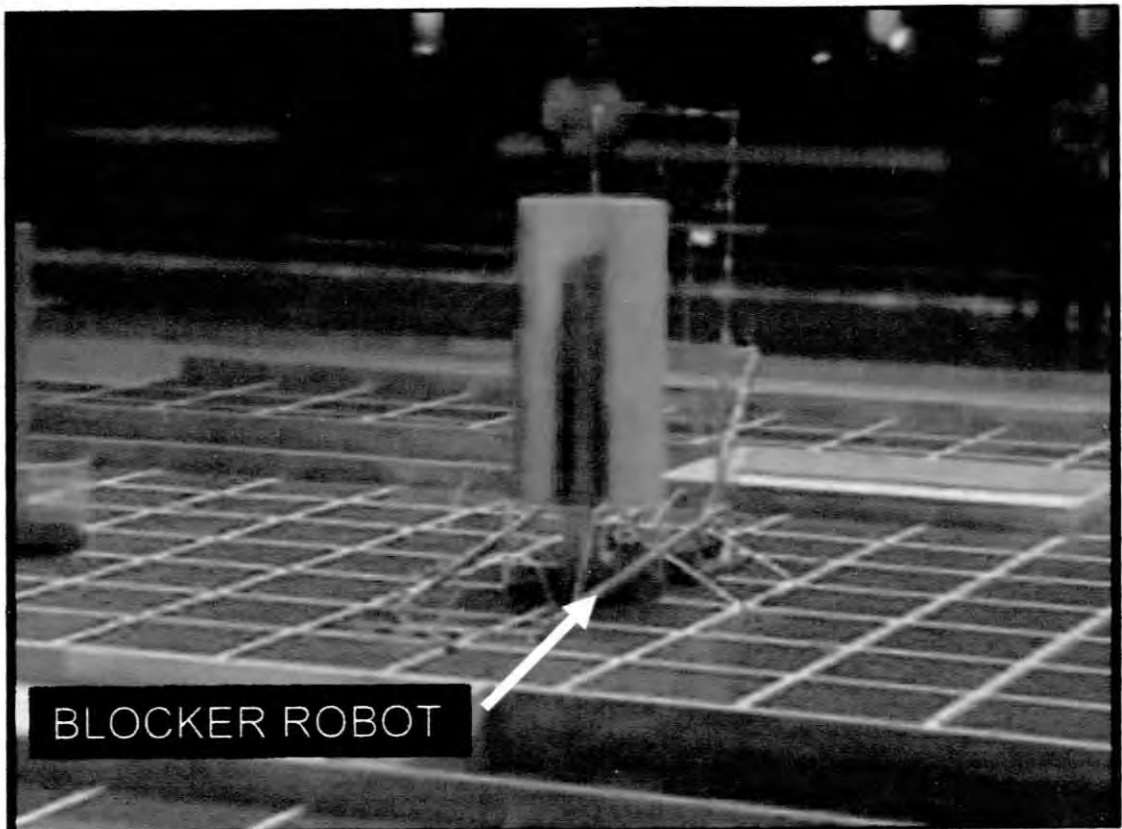


Figure 2.2 : The siege blocking method.

2.1.3 Example 3 – Team ROBOCON MMU 2

Thirdly is team ROBOCON MMU 2 . This team is using a same concept with UTM A but with additional advantage. This team is using the very long fishing rod and the robot also throws the white ribbon. The purpose of throwing the ribbon is to make a obstacle for the opponent team. Most team robot is using the line tracking system to move. The movement will be straight and fast if using the line tracking concept. The rational to throw the ribbon is to make sure the robot that use infra red sensor to detect the line will not work properly because the ribbon colors is same as the line. So the robot cannot detect the exact line to move. Figure 2.3 shows the blocking robot for the MMU 2 team.

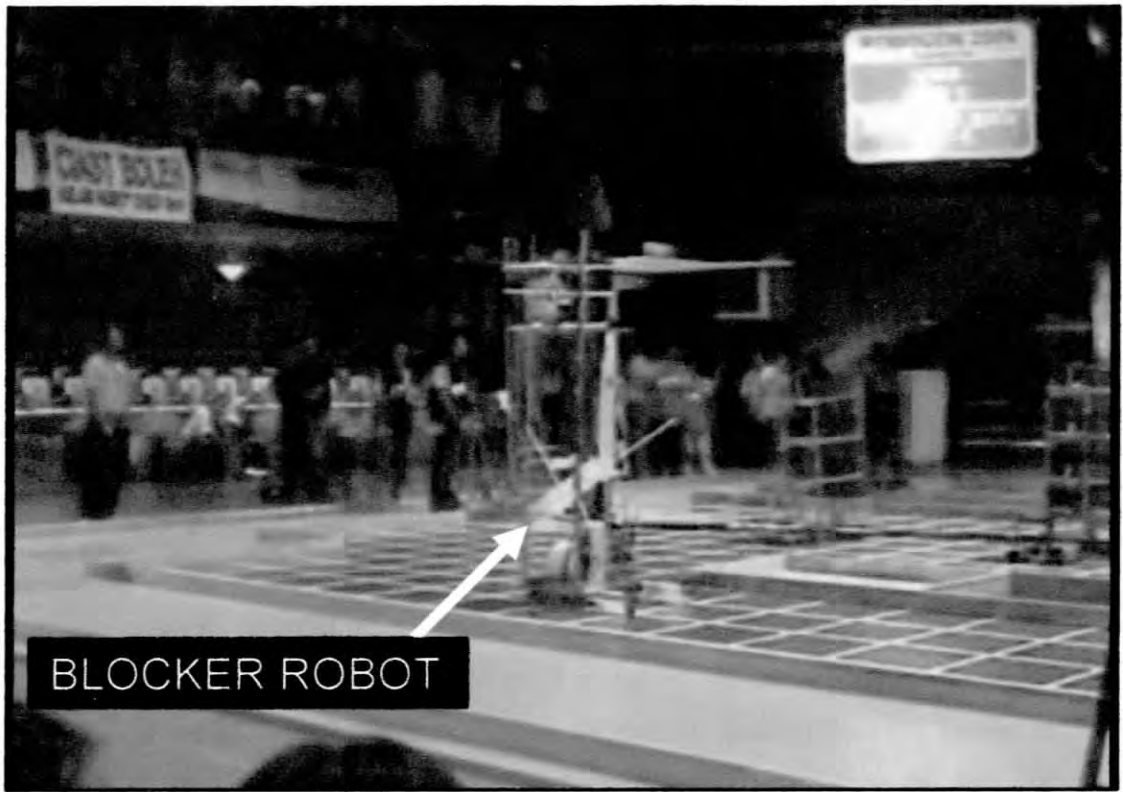


Figure 2.3 : The MMU 2 blocking robot with the long fishing rod and the white ribbon thrower.

From the three example of blocking type, there is an advantage and disadvantages of each blocking type. The blocking type is performed base on the capability of the programming, the material used, and the concept to use.

2.2 Review of the previous line tracking concept

In this part, the previous project that based of the line tracking project will be explained. The project is performed by the Sven Horstmann. Sven says that his project propose to build a robot that tracks a line without constantly jerking left-right-left. Sven tried a solution with moving light sensor but the project is fail. The next idea is a robot with 3 light sensors, mounted side by side to the front of the robot, but that would consume all the ports of the RCX(Lego Mindstrom controller device). So Sven started a little analysis on the input ports of the RCX (using scope and a multimeter, without taking anything apart, so Sven don't know if the real light sensor is constructed similar to it). And then Sven have build a prototype of a 3-channel light sensor, that needs only one input of the RCX and also uses the internal power supply provided by the RCX. The interface consists only of a 6 diodes (1N4148), needed to compensate the fact that a sensor can be connected in any direction to the port, and the polarity changes when turning the connector 90 degrees and also to separate the supply power from the analog signal to be input to the RCX. Figure 2.4 show the combination of the power separator circuit with line tracker circuit that is performed by the Sven.

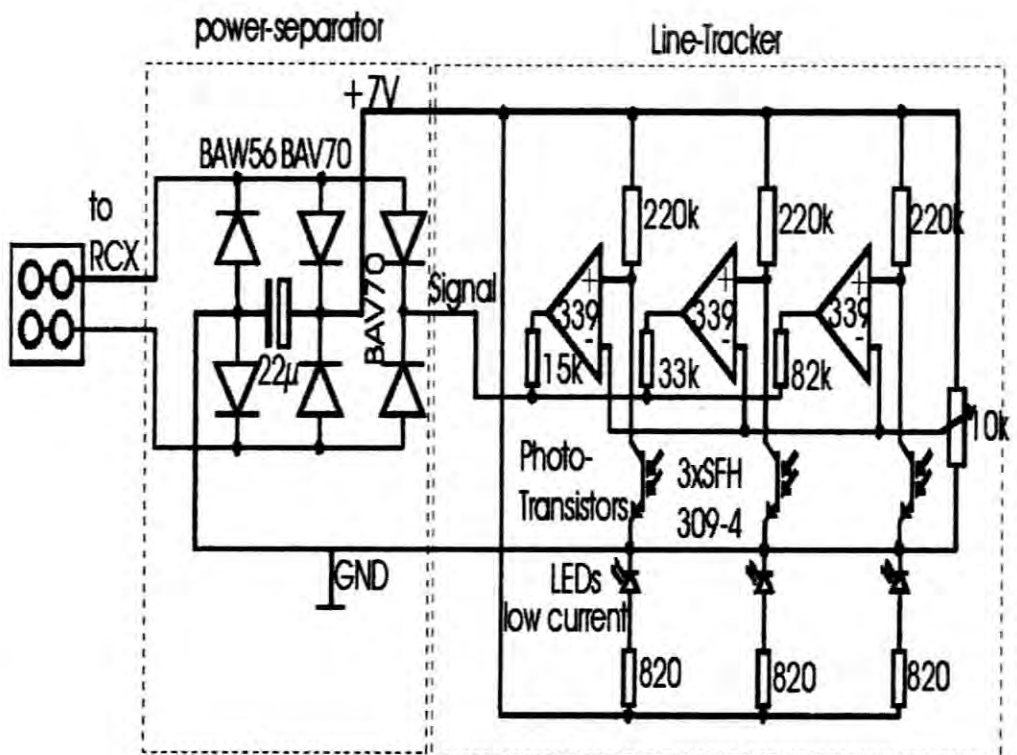


Figure 2.4 : Circuit that has been performed by the Sven. It contains the line tracker circuit and power separator circuit.

The line sensor has 3 phototransistors that provide 3 analog signals, these are threshold by 3 comparator. The 3 dark/bright signals are then combined by 3 resistors (like in an example to combine multiple touch sensors by Paul Haas) to perform on analog signal, that is input to the RCX. By checking the range of the input value, the Sven determine which of the phototransistors sees black or white. When this 3 sensors are mounted on the front side of the robot, Sven said that it can tell if there is the line. This prototype is still in study but it can be guided to add a new sensor to the RCX that need a power supply.